1 387 650

PATENT SPECIFICATION (11) 1 387 650

(21) Application No. 56454/72 (22) Filed 7 Dec. 1972 (19)
(31) Convention Application No. 7 220 348 (32) Filed 6 June 1972 in
(33) France (FR)
(44) Complete Specification published 19 March 1975
(51) INT. CL.² B21H 7/18 F16C 11/06
(52) Index at acceptance
B3M 19D 26 3X
B3A 90
E2F 1T1

(54) IMPROVEMENTS IN OR RELATING TO BALL-AND-SOCKET JOINTS

(71) I, JEAN PERRIER, a French Citizen of Les Gauthiers, 89130 — Toucy, France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to mechanical ball-and-socket joints comprising a male member and a female member, the male member being able to rotate and oscillate in the female member. The male member, generally called a pivot, normally comprises a head which is spherical or annular or composed of two half-spheres of different diameters and a cylindrical shank partly drawn or milled, a groove being provided at the base of the head and/or a cone between two cylindrical parts of the shanks. Joints of this type are currently used in the steering and suspension of motor vehicles of all types.

According to the present invention, there is provided a method of producing a groove on a pivot having a hollow head for a ball-and-socket joint, wherein the groove is produced exclusively by cold-rolling without metal removal or the production of chips, the pivot being rolled simultaneously with the production of the groove.

According to another feature of the invention, the rolling operations are carried out by two embossed rollers mounted about axes which are a fixed distance apart, the working surfaces of the rollers carrying out the complete cycle of these operations continuously and in one revolution thereof.

The above-described method of production of the grooves according to the invention gives the pivot better mechanical properties.

It does not break any metal fibres and increases the resistance of the pivot precisely at the location of the groove which is the most fragile.

It improves the surface condition, which becomes dished, and makes it possible to precisely dimension the pivot.

At the end of the rolling operation, a pivot having the following characteristics is obtained:

—an excellent tolerance of the sphere;
—an excellent tolerance of the rolled diameters; and
—accurate dimensions parallel to the pivot axis.

In addition to its mechanical properties, the method of manufacture according to the present invention allows a considerable reduction in costs due, in the first place, to a saving of metal, the weight of the blank and of the finished pivot remaining the same, and in the second place, to the speed of production, which can reach several thousands of parts per hour.

An embodiment of the present invention will now be described by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is an axial part-section through a pivot blank.

Fig. 2 is an axial part-section through a finished pivot corresponding to the blank of Fig. 1.

Fig. 3 is a diagrammatic front view of two embossed rollers having a fixed distance between their axes.

Figs. 4, 5 and 6 illustrate in axial section a blank during the various stages of manufacture and one of the two embossed rollers associated therewith.

Referring to Fig. 1, which is an axial part-section, the pivot blank comprises a spherical head 1 which is partially hollow and a shank constituted by a first cylinder 3, a conical part 5 connected to a second cylinder 7 of lesser diameter than that of the first cylinder 3 by means of a chamfer, 9, and a chamfer 11 forming the end of cylinder 7.

Fig. 2 shows a finished pivot obtained from the blank of Fig. 1. This finished pivot comprises the spherical head 1 and a

[/

shank constituted, due to alterations made to the blank of Fig. 1 in the region of the cylinder 3 and the conical part 5, by a groove adjacent the spherical head 1, a cone 15, a cylindrical part 17 and a conical part 19. This conical part 19 is extended by a chamber 21 and by a cylindrical part 23 terminated by a chamfer 25.

Due to the deformations undergone by the blank, the dimension 27 measured from the centre of the spherical head to the dividing line of the cylinder 3 and the conical part 5 (Fig. 1) is clearly shorter than the desired final dimension 29 measured from the centre of the spherical head to the dividing line of the cylindrical part 17 and the conical part 19.

To carry out the operations for transforming the blank into the finished pivot, the blank 1 is introduced between two embossed rollers 31 and 33 having a fixed distance between their axes as illustrated in Fig. 3, by means of two notches 39 and 41 which also serve for the extraction of the pivot.

The two opposing working surfaces of these two embossed rollers have shapes designed to carry out on the blank, continuously and in one revolution of the embossed roller, the complete cycle of the successive operations for producing the groove, with elongation of the blank and finally rolling of the sphere and cone. These embossed rollers rotate in the directions indicated by arrows 35 and 37 and cause the rotation of the blank for a plurality of revolutions. The diameter of these embossed rollers is calculated in order that the penetration per revolution of the projections of the embossed roller in the blank is not so great as to cause excessive stresses. The number of revolutions of the blank is approximately equal to the ratio of the diameter of the embossed rollers and of the diameter d of the cylindrical part 7 of the blank. For example, for a diameter of the embossed rollers of 200 cm and for a diameter $d = 17$, there are 12 revolutions of the blank, and, if the depth of the groove is 2 mm, the penetration per revolution in the blank is 0.165 mm at the radius.

Figs. 4, 5 and 6 make it easier to understand the cycle of the operations carried out by the two embossed rollers.

Fig. 4 shows the blank 41 placed adjacent the surface of an embossed roller 43. Initially, this shape corresponds substantially to the contour of the axial section of the blank 1, leaving a clearance 45 with the exception of the cylindrical part 47 which is kept in contact with the embossed roller 43. This cylindrical part 47 therefore ensures the positioning and the rotation of the blank.

According to its position on the embossed roller, and starting from its illustration in Fig. 4, the shape of the embossed roller changes due to the progressive appearance of a projection 49 facilitating the production of the groove 51 in the blank 41 and the elongation of the blank. The distance from the cone to the centre of the sphere clearly increases in the same proportion on the blank and on the embossed rollers. This rolling may normally be carried out without previously annealing the blanks. Annealing would be indispensable only if splintering due to cold-hammering of the metal prior to rolling occurred.

When the rolling of the groove has been carried out, the embossed rollers effect the rolling of the sphere 53 and of the cone 55. The shape of the embossed roller thus corresponds exactly to the shape of the axial section of the blank with the exception of the zone 57 for rolling the groove 51 where a slight clearance is provided. This clearance provided in this zone 57 where the tolerance is greater, makes it possible to compensate for the inevitable variations of volume from one blank to another. The rolling of the cone 55 is an excellent guarantee both for the taper of the cone 55 and for the dimension measured from the centre of the spherical head to the dividing line between the cone 55 and the adjacent cylindrical part. Nevertheless, the rolling of the cone is not indispensable when the requirements imposed do not necessitate it.

Clearly, this method could be used not only with rotating embossed rollers but also with straight profiled dies. The use of these straight dies would be indispensable if the embossed rollers which can be mounted on standard commercial machines gave too great a penetration into the pivot per revolution and a resulting weakening of the pivot.

WHAT I CLAIM IS:—

1. A method for producing a groove on a pivot having a hollow head for a ball-and-socket joint, wherein the groove is produced exclusively by cold-rolling without metal removal or the production of chips, the pivot being rolled simultaneously with the production of the groove.

2. A method according to claim 1, wherein the rolling operation is carried out by two embossed rollers mounted about axes which are a fixed distance apart, the working surfaces of the rollers carrying out the complete cycle of the rolling operation continuously and in one revolution thereof.

3. A method according to claim 1 or 2, wherein the rolling operation is carried out with straight profiled dies.

4. A method according to any one of the preceding claims, wherein one area of

clearance is provided, when rolling the sphere and the cone of a pivot, the clearance being provided in a region of the pivot where the tolerance is greatest in order to compensate for the variations in volume from one blank to another.

5. A method for producing grooves on pivots for ball-and-socket joints substantially as herein described with reference to the accompanying drawings.

MARKS & CLERK,
Chartered Patent Agents,
Agents for the Applicant.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1975.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

1387650 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

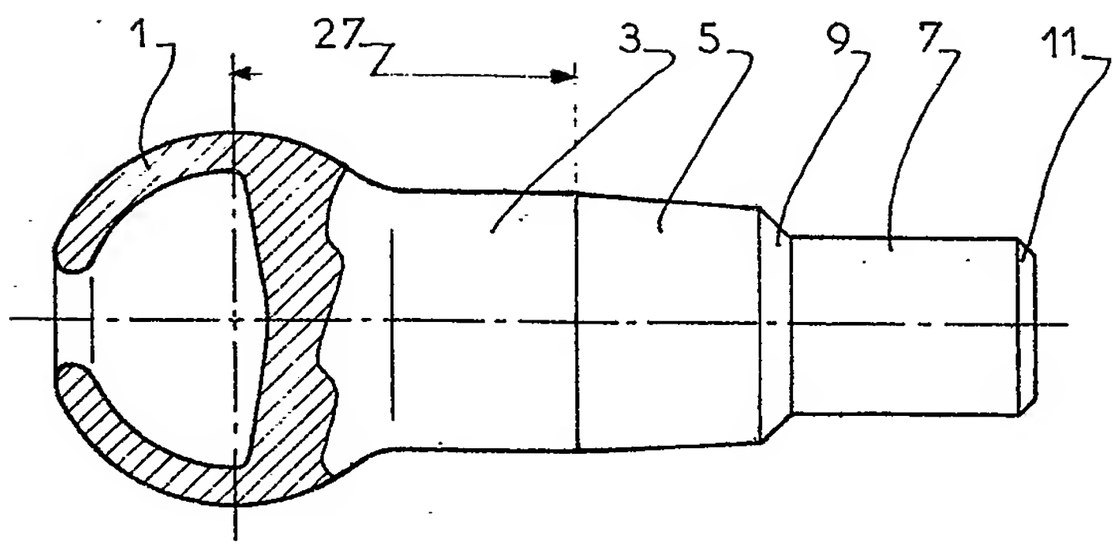

FIG 1

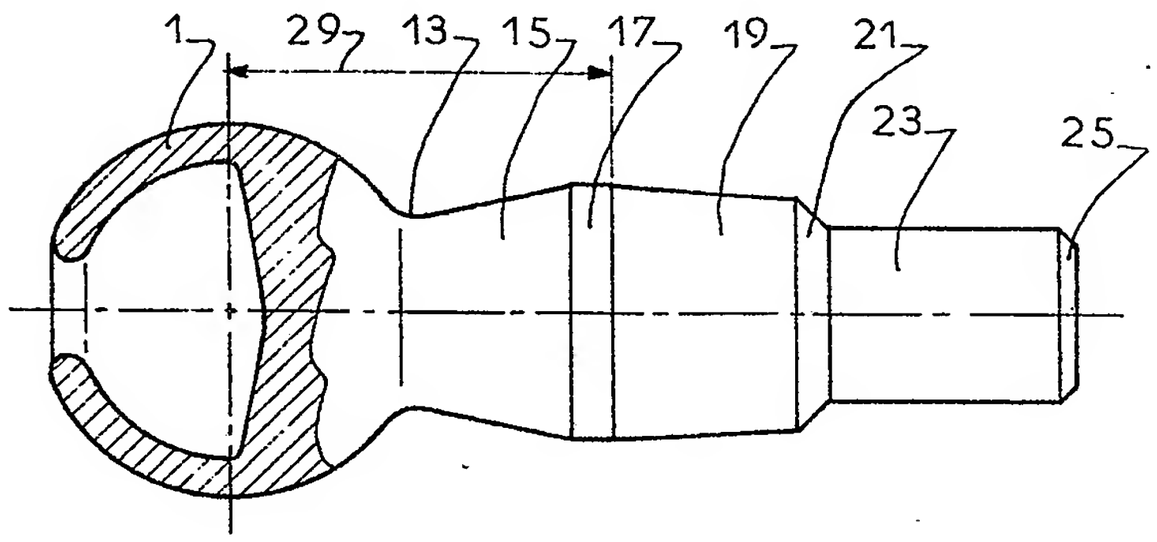

FIG 2

1387650 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

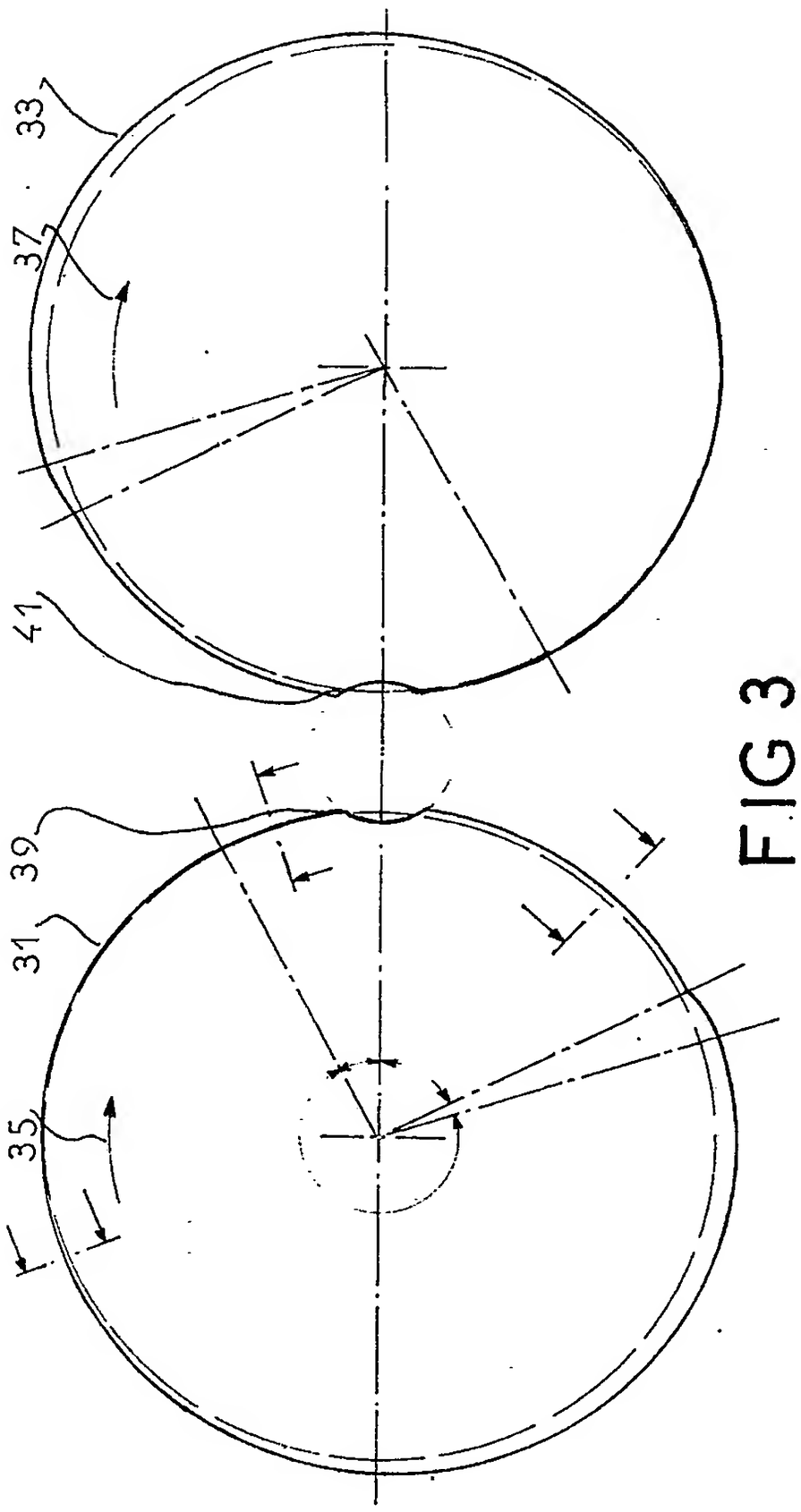

FIG 3

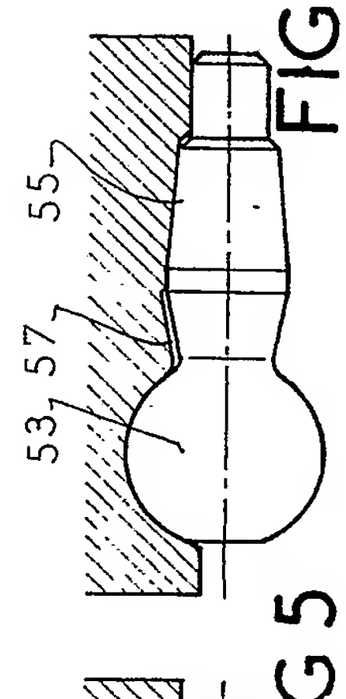

FIG 6

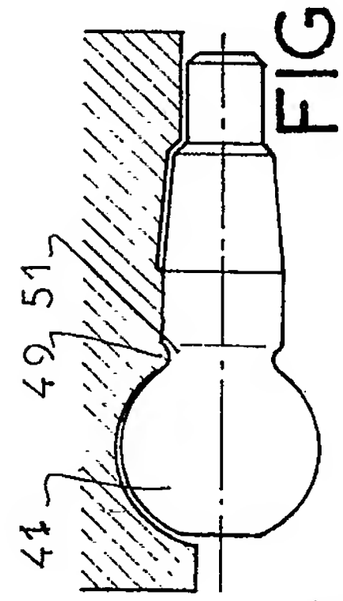

FIG 5

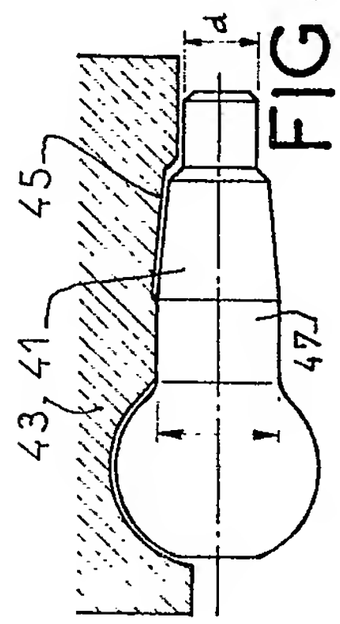

FIG 4

DERWENT-ACC-NO: 1975-D1670W

DERWENT-WEEK: 197512

TITLE: Socket of ball joint produced by rolling in which shank is grooved and socket head shaped

PATENT-ASSIGNEE: J PERRIER[PERRI]

PRIORITY-DATA: 1972FR-020348 (June 6, 1972)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
GB 1387650 A	March 19, 1975	EN

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	B21H1/18 20060101
CIPS	B21K1/44 20060101
CIPS	F16C11/06 20060101

ABSTRACTED-PUB-NO: GB 1387650 A

BASIC-ABSTRACT:

Ball and socket joint has its socket shaped and provided with a groove between the head and the shaft by rolling between a pair of rolls. The rollers may be replaced with straight profiled

dies. The groove is produced by rolling without the removal of metal and hence there is a reduction in cost due to the saving in metal. The embossed rollers have shapes such that the operation is carried out in one revolution of the rollers. The blank to be rolled is placed in adjacent notches on the periphery of the rollers and these notches are also used for extracting the rolled article.

TITLE-TERMS: SOCKET BALL JOINT PRODUCE ROLL SHANK GROOVE HEAD SHAPE

DERWENT-CLASS: P52 Q62